

“World Record” Specimens of *Haliotis* Species of the West Coast of North America - a Brief Description and Photo Study

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INTRODUCTION

This report will be written in a casual, less formal style that seems more appropriate for a discussion of world record shells. It will be primarily of interest for the collection of photo images presented, though collectors of our west coast species will probably find the other information of interest as well. For the purpose of this study, we will consider those species and subspecies distributed from Southern California to Alaska, though the four subspecies found in Baja California, Mexico, will be mentioned briefly as well. The world's three largest members of family Haliotidae are found among these west coast taxa, one in a virtual tie for number three position with *Haliotis madaka* Habe, 1977, a Japanese *Haliotis*, and we will begin this discussion with these three. However, first it might be of interest to explore the most important environmental conditions that coincide with the distribution of giant *Haliotis* taxa. (see also Owen and Dinucci, 2004).

Ecological Conditions found where Large Species of *Haliotis* Exist

In general, the world's largest *Haliotis* species are found in temperate seas that have two major environmental parameters in common. These conditions are, but are not necessarily limited to: 1) Areas where an upwelling of cold nutrient-rich water promotes the growth of copious amounts of the large species of red and brown algae (particularly the latter), which provide an excellent food source or large species of abalone, and: (2) Very

exposed sections of coastline where sea and surface weather (wind) conditions are frequently very rough, often precluding diving. For example, on the north coast of California and Oregon, where the world's largest species (*H. rufescens* Swainson, 1822) grows to massive proportions, some of the most formidable sea conditions on the west coast of North America frequently occur. Huge Pacific Ocean swells often batter the coast in the winter months, and in the spring, strong northwest winds buffet the coastline. These factors promote the major upwelling, circulation and strong ocean currents necessary for the growth and distribution of algal food to drift feeding mollusks like abalone. Similar conditions are found near the southern tip of South Africa and in South Australia, where other large *Haliotis* and species of brown algae are found. In contrast, warm, quiet, tropical seas, such as exist in much of the Indo Pacific Basin, are generally inhabited by very small species of *Haliotis* which feed on tiny forms of algae and other food species. There are additional factors at work which help produce these differences, but cold temperatures caused by strong northwest wind upwelling is the primary factor influencing large size in *Haliotis* of the west coast of North America.

MATERIAL AND METHODS

Abbreviations of Collections. BMC: Bob McMillen Collection; BOC: Buzz Owen Collection; BSC: Bob Spinale Collection; DDC: Dwayne Dinucci Collection; JPC: John Pepper

Collection; LACM: Los Angeles County Museum Collection; PMC: Pete McLaughlin Collection.

The eight taxa found on the West Coast of North America between California and Alaska, will be listed first in the order of their maximum sizes. Following this, the four subspecies endemic to Baja California, Mexico, will be listed similarly. The measurements used will be those taken by the author, or those listed in the most recent version of "Registry of World Record Sized Shells" by Philippe Quiquandon, the standard reference for information on world record size mollusks and gastropods. This text is kept very current, with updates being published regularly. In the present work, measurements are frequently, but not always, listed in both mm and inches, for clarification. Photo images were taken with a Canon G6 digital camera with 7.1 megapixels resolution, and the images processed in Adobe Photoshop Version 4.

RESULTS

The Largest Recorded Specimens of the West Coast *Haliotis* Species:

Haliotis rufescens Swainson, 1822. Pl. 1A; 1B

Common Name: The Red Abalone.

Size: 12 $\frac{5}{16}$ " (313.0 mm).

Taken By: John Pepper.

Date: 5 Sept. 1993.

Locality: Oregon.

2nd Largest: 11 $\frac{29}{32}$ " (302 mm).

Other: World's largest known abalone shell. Only specimen known to have reached or exceeded the "mythical" size of 12 inches.

Reference: "Of Sea and Shore" 26:4:103-107.

Provenance: JPC.

Haliotis fulgens fulgens Philippi, 1845. Pl. 1C; 1D

Common Name: The Green Abalone.

Size: 10 $\frac{1}{32}$ " (255.0 mm).

Taken By: D. D. "Darrell" Forman.

Date: Early 1950's.

Locality: Asunción Is., Baja Calif., Mexico. Beach shell.

2nd Largest: About 9 $\frac{3}{4}$ ".

Other: Only specimen known 10" or larger.

Reference: "Of Sea and Shore" 25:3:103-107.

Provenance: BOC.

Haliotis corrugata corrugata Wood, 1828. Pl. 3A; 3B

Common Name: The Pink Abalone.

Size: 9 $\frac{5}{8}$ " (245.7 mm).

Taken By: Unknown Calif. F&G diver.

Date: Sept. 1954.

Locality: Portuguese Bend, Palos Verdes Peninsula, California.

2nd Largest: About 8 $\frac{3}{4}$ " (223.0 mm).

Other: A giant - over $\frac{3}{4}$ " larger (22.4 mm) than 2nd largest known specimen. Found just before the destruction of the Palos Verdes area by pollution from Los Angeles/San Pedro Harbor.

References: Geiger & Owen, (2012)

Provenance: LACM.

Haliotis cracherodii cracherodii Leach, 1814. Pl. 2A; 2B

Common Name: The Black Abalone.

Size: 8 $\frac{1}{2}$ " (216.5 mm).

Taken By: Pete McLaughlin.

Date: Aug. 1990.

Locality: Pedro Point, Calif.

2nd Largest: A pair of shells 8 $\frac{3}{8}$ ".

Other: A little known and previously unphotographed specimen.

References: Geiger & Owen, (2012)

Provenance: PMC.

Haliotis sorenseni Bartsch, 1940. Pl. 3C; 3D

Common Name: The White Abalone.

Size: 8 $\frac{13}{16}$ " (225.1 mm).

Taken By: Bob McMillen.

Date: 1970's.

Locality: Probably Sta. Cruz Is., Calif.

2nd Largest: Three specimens exist of approx. the same size (see Discussion).

Other: Several large *H. rufescens* x *H. sorenseni* hybrids have been miss-identified as *H. sorenseni*.

References: Geiger & Owen, (2012)

Provenance: BMC.

***H. kamtschatkana assimilis* Dall, 1878. Pl. 4A; 4B**

Common Name: The Threaded Abalone.

Size: 7 ⁵/₁₆" (187.4 mm).

Taken By: Unknown commercial diver.

Date: 1959.

Locality: Point Conception, Calif.

2nd Largest: Several known about 6 ⁷/₈" (175 mm).

Other: Shell is a broken specimen found on the commercial shell pile of A.R. Pierce in Goleta, Calif., in Sept., 1959.

References: Geiger & Owen, (2012)

Provenance: BOC.

***H. kamtschatkana kamtschatkana* Jonas, 1846. Pl. 4C; 4D**

Common Name: The Pinto Abalone.

Size: 6 ³/₈" (162.3 mm).

Taken by: Unknown diver.

Date: 2005.

Locality: British Columbia, Canada.

2nd Largest: About 6 ¹/₄" (159 mm).

Other: A very eroded senile specimen which is typical of shells >6" (153 mm).

References: Geiger & Owen, (2012)

Provenance: BSC.

***H. walallensis* Stearns, 1899. Pl. 2C; 2D**

Common Name: The Flat Abalone.

Size: 7 ¹/₃₂" (179 mm).

Taken By: Dwayne Dinucci.

Date: 2004.

Locality: North of Crescent City, Calif.

2nd Largest: 7" (178 mm).

Other: A number of specimens are clustered at about this size (~7", or specifically 175-176 mm).

References: Geiger & Owen, (2012)

Provenance: DDC.

The Largest Recorded Specimens of the West Coast *Haliotis* Subspecies Endemic to Baja California, Mexico.

Four *Haliotis* subspecies exist in Baja California, Mexico. Three are endemic to Guadalupe Island, and the fourth is isolated at the extreme point of the southern distribution of the *H. fulgens* complex: Santa Margarita Island, Magdalena Bay. As far less material has been examined from these isolated populations (estimated at two to five thousand of each), the largest specimens found thus far may not provide an accurate appraisal of the maximum sizes which might be found had a larger sample been available for study. For example, I strongly suspect that *H. fulgens guadalupensis* Talmadge, 1964, reaches sizes in excess of the currently largest known specimen (to me) which measures 7 ⁵/₁₆" (186 mm). The reasoning here is that there are more exposed areas on the "weather" (west) side of the island from which I have yet to examine large volumes of material (such areas typically produce the largest individuals). I strongly suspect that the largest abalone from some of these areas might well exceed 8" (203 mm) in size. In any case, the largest specimens of these four subspecies known to me are listed and photographed herein. They are as follows:

***Haliotis fulgens guadalupensis* Talmadge, 1964. Pl. 6A**

Common Name: Guadalupe Island Green Abalone.

Size: 7 ⁵/₁₆" (186 mm).

Taken by: Conrad "Connie" Limbaugh.

Date: April, 1956.

Locality: Near Weather Station, at Melpomene Cove, near Morro Sur, at south end of Guadalupe Island, Baja California, Mexico.

Second Largest: I have seen a number of shells around 7" (est. 8-10).

References: "*Of Sea and Shore*" 27:2:126-131; 3 pl.

Other: A young, very healthy fast growing specimen – would probably have grown to a larger size had it not been collected.

Provenance: BOC.

***Haliotis corrugata oweni* Talmadge, 1966. Pl. 6B**

Common Name: Guadalupe Island Pink Abalone.

Size: 6 ⁵/₈" (168 mm).

Taken By: Mexican commercial diver.

Date: 1998.

Locality: Near West Anchorage, Guadalupe Island, Baja California, Mexico.

Second Largest: A number of specimens have been examined very close to this size.

References: "*Of Sea and Shore*" 25:4:272-275, 288; 3 pl.

Other: The larger shells of this subspecies are often not saved by the Mexican commercial *Haliotis* divers due to their usually being badly encrusted and perforated by numerous boring organisms. Were this not the case, it is quite likely that shells 6 ³/₄" - 7" in diameter (est.) would have been found.

Provenance: BOC.

***Haliotis cracherodii californiensis* Swainson, 1822. Pl. 6C**

Common Name: Guadalupe Island Black Abalone.

Size: 5 ³/₄" (147 mm).

Taken by: Mexican commercial diver.

Date: 1998.

Locality: "Weather" (West) side of Guadalupe Island, Baja California, Mexico.

Second Largest: Many have been measured within about 6-8 mm of this size.

References: "*Of Sea and Shore*" 26:1:70-75; 3 pl.

Other: From the somewhat stunted population of extremely perforate and deep-proportioned specimens found on the "weather" (west) side of the island.

Note: A gigantic shell was discovered in 2006 that is 42 mm larger than the listed WR specimen. (pl. 7A). This shell was found by a shell dealer searching through material from Guadalupe Island, and is so large it is considered "an aberration" (Geiger & Owen, 2012).

Provenance: CRC.

***Haliotis fulgens turveri* Bartsch, 1942. Pl. 6D**

Common Name: None.

Size: 7 ¹¹/₁₆" (196 mm).

Taken By: Mexican commercial diver.

Date: 1959.

Locality: Magdalena Bay, Baja California, Mexico.

Second Largest: Much smaller. Examination of over 650 specimens taken in 1998-1999, yielded none over about 6 ¹/₂" (166 mm).

References: "*Of Sea and Shore*" 27:1:65-68.

Other: This largest recorded shell is truly a giant. None of the other original specimens from 1959 (several thousand shells) approached this size.

Provenance: BOC.

DISCUSSION

The Discussion will be broken down into sections treating each taxon, and will expand on some of the information given above, plus include other bits of data which might be of interest. The four Baja Californian subspecies won't be discussed further, as these are extensively covered in earlier articles in "*Of Sea and Shore*" (see: "References")

THE SPECIES

***Haliotis rufescens*:** The “Red Abalone” is far and away the world’s largest species of *Haliotis* (by well over 2”, or 58 mm). As such, giant specimens have been pursued with gusto and passion for well over 75 years, but to this date (Dec, 2014), so far as is known, only once has the much sought-after 12 inch size barrier been reached or exceeded. This singular specimen, a fast-growing very young male living in optimal environmental conditions, was about 27-30 years old (in the authors opinion) when it was found. It was taken at the precise moment in time when its shell was as large in maximum diameter as it would probably get, as it was about to lose approximately 6-8 mm in length due to sloughing off of the ostracum, or outer layer of shell, at the major measurement point near the posterior margin (spire area). For a more detailed discussion of giant specimens of *H. rufescens*, refer to the earlier article on large red abalone in Vol. 26, No. 4 of “*Of Sea and Shore*” (Owen and Dinucci, 2005).

***Haliotis fulgens fulgens*:** The “Green” Abalone is the 2nd largest species in the world, by about $\frac{3}{8}$ ” (10 mm). This largest recorded specimen exceeds the next largest shell I have measured by approximately $\frac{1}{4}$ ” (8 mm). It was once probably close to $10\frac{1}{4}$ ” in length, but has lost an estimated 6-8 mm of diameter due to erosion at the posterior margin of the shell. Specimens over 9” are extremely rare, and I have measured only 5-6 shells between 9” and $9\frac{3}{4}$ ”. The record specimen was reported to have been found on the beach at Asunción Island, Baja California, Mexico, but this locality is suspect, as most mature specimens of *H. fulgens* from central Baja California are much smaller.

***Haliotis corrugata corrugata*:** The “Pink Abalone” might be considered the “largest” of the West Coast world records, in that it exceeds the 2nd largest known individual by the greatest amount – over $\frac{3}{4}$ ” (20 mm). It is truly a giant. To one familiar with this species, the thought of

a specimen in excess of $9\frac{1}{2}$ ” (242 mm) staggers the imagination. I will never cease to wonder what the ecology of the Portuguese Bend area of the Palos Verdes Peninsula looked like in 1954 – before it was destroyed by pollution coming out of San Pedro and Los Angeles Harbor. The 2nd and 3rd largest specimens that I have knowledge of are a pair of specimens that measure $8\frac{3}{4}$ ” (222 mm). These were both taken (by the author) in 1959 – one at San Nicolas Island, and the other in very shallow water just south of Point Conception. Other than these two shells, I have knowledge of few much over 8” (203 mm) – which is very large for this species. Probably some of the largest “Pinks” ever taken, came from north La Jolla and San Nicolas Island, but whether other big shells from these areas were larger than about $8\frac{1}{2}$ ” is unknown to me.

***Haliotis sorenseni*:** At least three specimens of the “White Abalone” are clustered at approximately $8\frac{3}{4}$ ” (225 to 227 mm). However, two of these I have not examined personally, and they may well represent *H. rufescens* x *H. sorenseni* hybrids – as is frequently the case with large specimens suspected of being *H. sorenseni*. The shell illustrated on Plate 3 is the largest I have personally confirmed to *not* be this hybrid. It measures $8\frac{3}{4}$ ” (225.1 mm). I have several specimens of *H. rufescens* x *H. sorenseni* that measure over $9\frac{1}{4}$ ” (from 235 to 242 mm), plus the “World Record” example that measures just short of 10” (253 mm. Pl. 7A). A number of these hybrid specimens slightly in excess of 9”, have been mistaken for *H. sorenseni* by a number of collectors over the past 50 years. The correctly identified specimen of *H. sorenseni* on Pl. 3, was taken near Santa Barbara by Bob McMillen – in the same general area that Bartsch’s holotype specimen was found when he described the species. Curiously, one of the paratypes listed in the original description was in the personal collection of Andy Sorensen when I visited him at his home

in Carmel in 1959 (he was 97 years old at the time). This paratype is a very typical specimen of *H. rufescens* x *H. sorenseni*. This small episode underscores the problem one might have in correctly identifying *H. sorenseni*. Here we have the man who "discovered" the species and whom it was named after, *and* the man who described it, *both* making the *same* mistake in identification. In fairness though, it should be stressed that few specimens were known in 1940, the year the species was described, so neither Sorensen nor Bartsch were very familiar with it. One of these extremely large hybrids (242 mm) is illustrated on Plate 5 with a 212 mm *H. sorenseni* so this problem can be better understood.

***Haliotis cracherodii cracherodii*:** This largest recorded specimen of the "Black Abalone" exceeds by $\frac{1}{8}$ " a pair of specimens that both measure $8\frac{3}{8}$ " (213 mm). I know of few specimens that have reached or exceeded 8" (203 mm). Old-time commercial abalone fishermen from the Morro Bay area have mentioned seeing occasional specimens hit the old 8" "red bar" (measuring device) prior to Sept. 1959 when the size limit for red abalone was reduced from 8" to $7\frac{3}{4}$ ". These three largest recorded live-taken specimens came from well separated localities in California: Santa Cruz Is., Shell Beach (near San Luis Obispo), and Pedro Point, about 20 miles south of San Francisco. Shells over 7" are not common in collections, and would be considered very large.

***H. walallensis*:** The second largest specimen of the "Flat Abalone" is just 2 mm smaller than the record, at ~178 mm (exactly 7"). A group of 4-5 shells are clustered at $6\frac{15}{16}$ "- $7\frac{1}{32}$ " (175-176 mm). Nearly all are from extreme northern California to south-central Oregon. Unlike all the other West Coast species of *Haliotis*, there is a more pronounced clustering of specimens very near this maximum size of approximately 7". As a small commercial fishery for this species exists in south-central Oregon, large

numbers of individuals have been examined in recent years, and still a specimen over $7\frac{1}{32}$ " has not been found. In California, specimens over 6" appear to be very uncommon, and even in Oregon, shells over $6\frac{1}{2}$ " (166 mm) are rare indeed!

THE SUBSPECIES

***Haliotis kamtschatkana assimilis*:** This largest recorded example of the "Threaded Abalone" exceeds by about $\frac{1}{4}$ " (8 mm) the second largest specimen I have seen and measured. About 4-5 specimens are clustered at approximately 7" (179 mm) in size. All these huge shells came from 1-2 miles southeast of Point Conception in 35-60 feet (12-20 m) and were live taken by the author between 1959 and 1963. In this area were found the largest specimens of this subspecies that I have ever observed. This area has also produced a number of *H. rufescens* x *H. kamtschatkana assimilis* hybrids as well, which unlike *H. rufescens* x *H. sorenseni* hybrids examined earlier, would never be mistaken for either parent species, except possibly as a very small juvenile (without animal present). Specimens of *H. kamtschatkana assimilis* over 6" should be considered very large, and are uncommon.

***Haliotis kamtschatkana kamtschatkana*:** The previous record of the "Pinto Abalone", in the collection of Gordon Chan, measures $6\frac{1}{4}$ " (159 mm), and another large specimen in the Bob Spinale collection measures approximately the same size. Most shells approaching 6" (153 mm) are in extremely poor condition due to encrustation and erosion and are not collected or saved by the average shell collector. A specimen measuring 110.3 mm from Sitka, Alaska, is illustrated to give an idea what a large shell with better sculpture detail looks like. Specimens over $5\frac{3}{4}$ " (>145 mm) are uncommon in my experience. I have a large series (>50) of this subspecies from Sitka, which contains a few specimens about $5\frac{3}{4}$ ".

This series is of particular interest as it was taken at approximately the northern extreme point of *Haliotis* distribution on the West Coast of North America. These specimens provide an interesting comparison to examples of the southern subspecies *H. kamtschatkana assimilis* from central Baja California, Mexico – some 4,500 km distant!

Final Remarks. As nearly all species of West Coast abalone are no longer taken from natural populations, it is not likely that new records for size are going to be found, unless they exist in old collections, which to me seems doubtful. The exception, of course, is *H. rufescens* which is pursued aggressively. I personally doubt that the 12 $\frac{5}{16}$ " (313 mm) red abalone record is likely to be broken any time soon – almost $\frac{1}{2}$ inch (11 mm) separate this giant shell from the second largest known, and this is a substantial difference. Still, "records are made to be broken", and with time, almost certainly a larger shell will be found – the main question being how much time. I have a specimen that was the largest known *Haliotis* shell for 31 years (1952 to 1983). It measures 293 mm (a fraction of a mm over 11½"), and while it "held the record", about 4-5 other shells challenged it very closely, some being less than 1/32" (<1 mm) smaller. The current record is a true giant, with no other known specimens remotely close to it. Again, aside from Dwayne Dinucci's second largest shell which measures almost half an inch (11 mm) less than 313 mm, the next largest shells are 14-15 mm smaller – a substantial difference. Though I believe it more likely that a new record would be found due to a currently unknown specimen being live-taken from natural populations, there remains the chance that it could come from an old little-known collection. Personally, I seriously doubt this. I believe that if such a spectacularly large shell existed, it would have come to our attention long ago. This belief is reinforced by the many

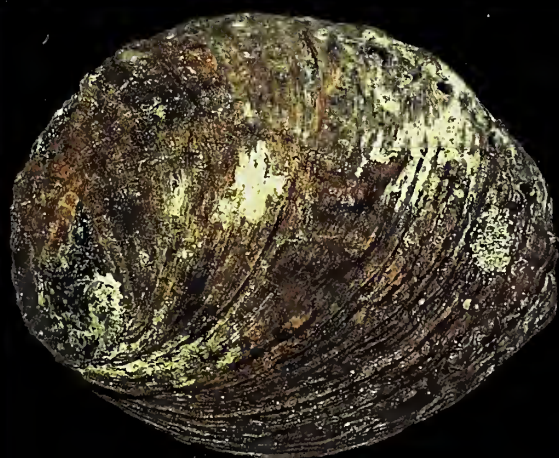
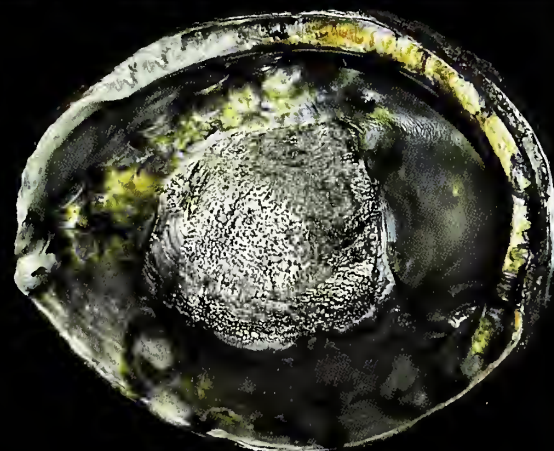
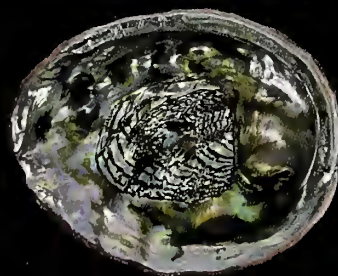
"wild goose chases" that I have participated in since the early 1950's, running down stories of nonexistent "12 inch" shells, and also by an event that happened in 1959, when I visited Andy Sorensen at his home in Pacific Grove, California. On this visit, I had with me the huge 293 mm specimen of *H. rufescens* mentioned earlier in this paragraph. (it was live-taken in August, 1952, at Crook Point, San Miguel Island, California.) It had just come into my possession two weeks earlier, and I wanted to see what his reaction would be upon seeing this giant shell. It was well known to a number of shell collectors and myself, that for many years Mr. Sorensen had offered a reward of \$100.00 to anyone who would bring him a 12-inch abalone shell to measure and confirm that it was indeed that size (or larger). It was equally well known that *no* one had ever succeeded in showing him such a specimen and collecting this reward. Armed with this knowledge, I showed him the 293 mm (11½ inch) shell. He held it in his hands, measured it very carefully a number of times, and studied it for several minutes. He then looked up at me, smiled, and said very seriously: "Young man, that is the largest abalone shell I have seen and measured in my life" (a good friend of mine, Chuck Snell, was with me and witnessed this event). Andy Sorensen was very familiar with the Japanese commercial fishery and divers that worked in the Monterey area in the early 1900's, and this observation further strengthened the conclusion that this specimen was with little doubt the largest abalone shell known at that time. Indeed, this shell survived all challenges and remained largest known for 31 years (1952-1983), until a specimen 11¾" (298 mm) was taken by Don Thorp at Shelter Cove, California, in September, 1983. With all this in mind, one can see why I am very skeptical that a shell will be found in the near future to displace the current record of 12 $\frac{5}{16}$ " (313 mm).

ACKNOWLEDGEMENTS

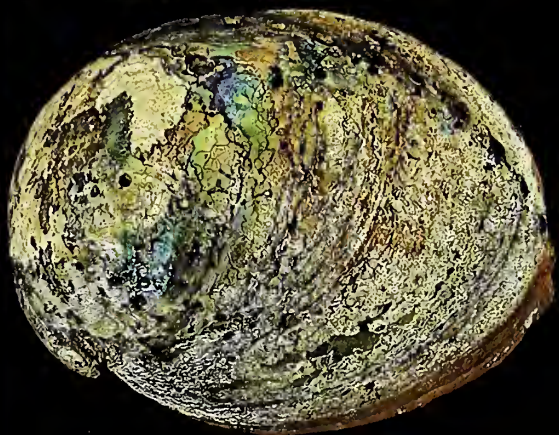
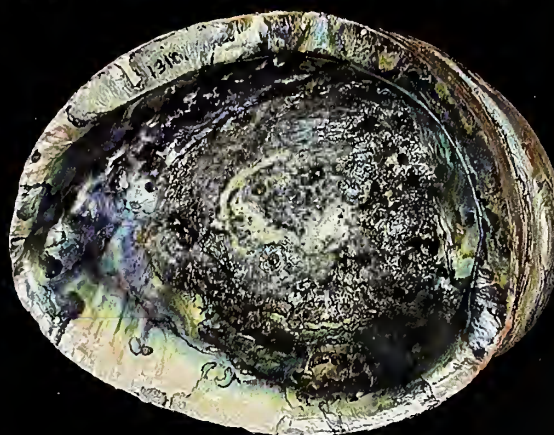
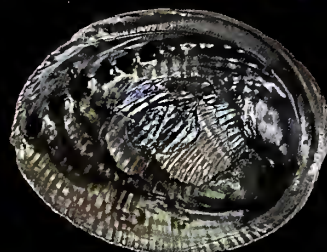
I wish to thank Steve Browning, Tom Grace, and David Leighton for reviewing the manuscript and plates and offering helpful comments and suggestions. I wish to thank Jim McLean for providing photographs of the world record specimen of *H. corrugata corrugata*, and Pete McLaughlin for letting me photograph his world record black abalone (*H. cracherodii cracherodii*). Other collectors permitting me to photograph their world record specimens include Bob McMillen, Dwayne Dinucci, John Pepper, and Bob Spinale, and I wish to express my gratitude to them all.

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**A****B**

B: *H. rufescens*. San Miguel Is., Calif. 211.5 mm. (Typical specimen to better illustrate species - not to scale with record)

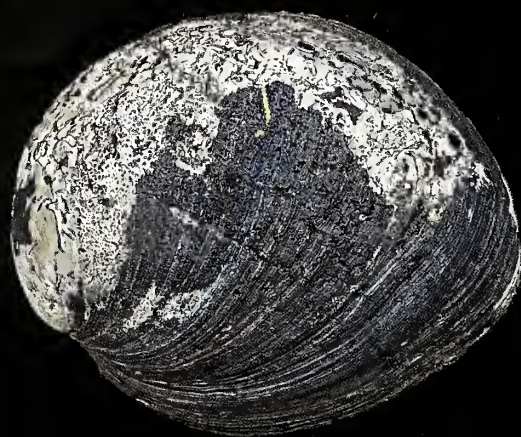
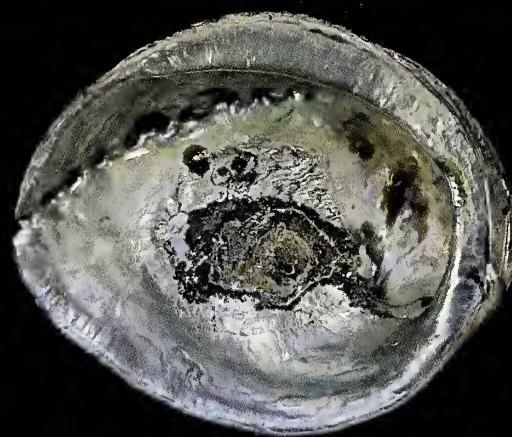
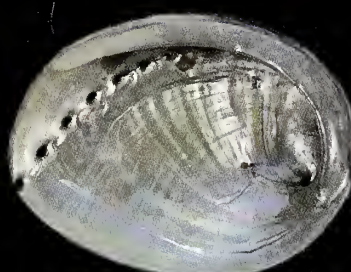
**C****D**

D: *H. f. fulgens*. B. C., Mexico. 164.2 mm. (Typical specimen to better illustrate species - not to scale with record)

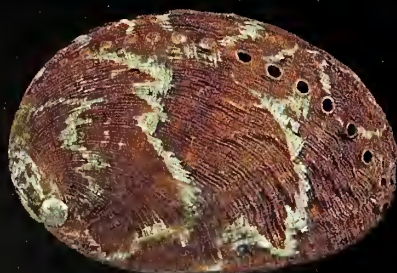
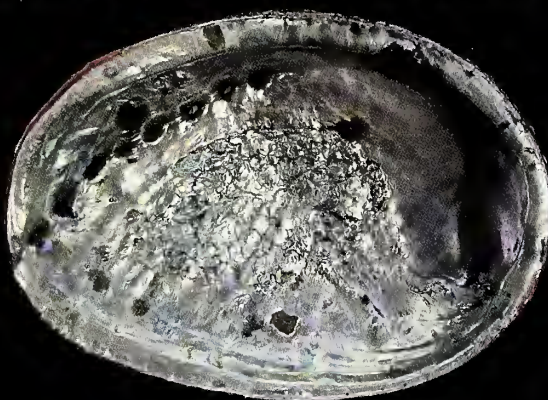
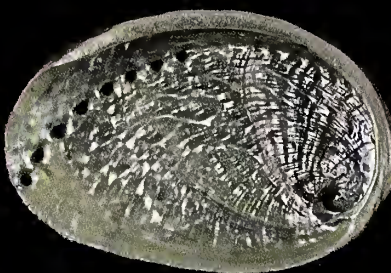
Plate 1

A: *H. rufescens* Swainson, 1822. W. Record: 313.0 mm (12 5/16"). John Pepper. Oregon. 1993.

C: *H. f. fulgens* Philippi, 1845. W. Record: 255 mm (10 1/32"). Buzz Owen. Baja Calif., Mexico. 1957.

**A****B**

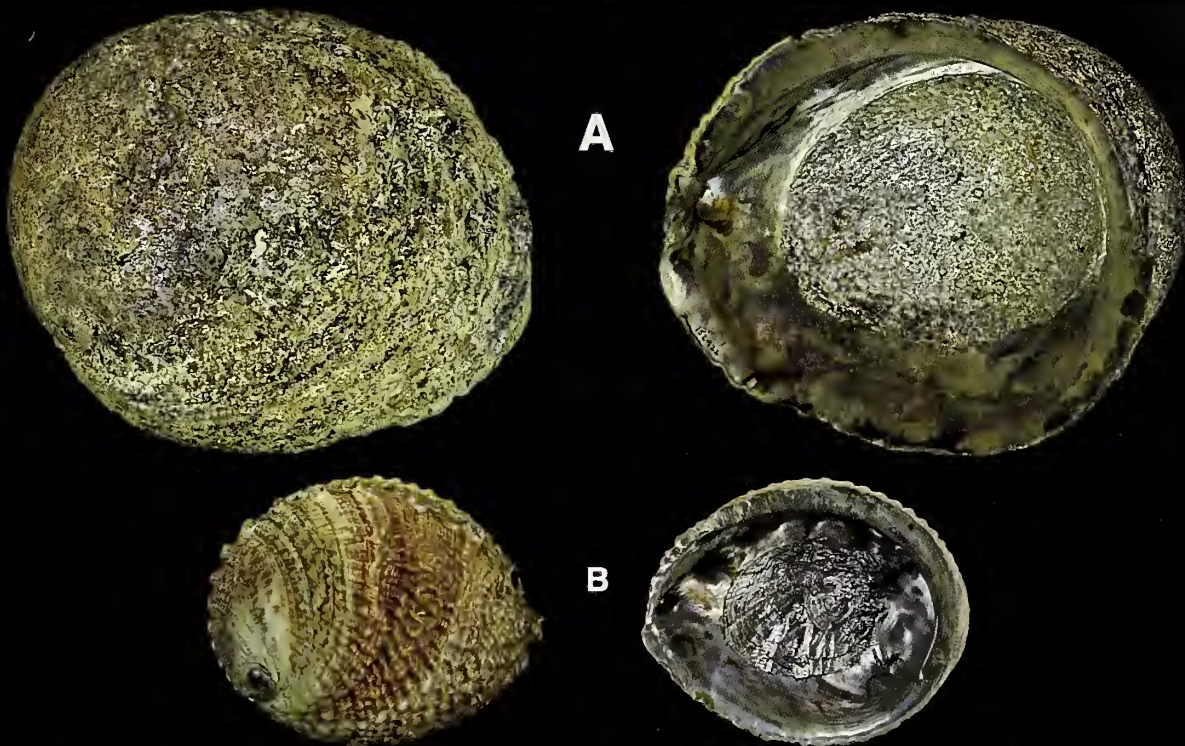
B: *H. c. cracherodii*. B. C., Mexico. 126.4 mm. (Typical specimen to better illustrate species - not to scale with record)

**C****D**

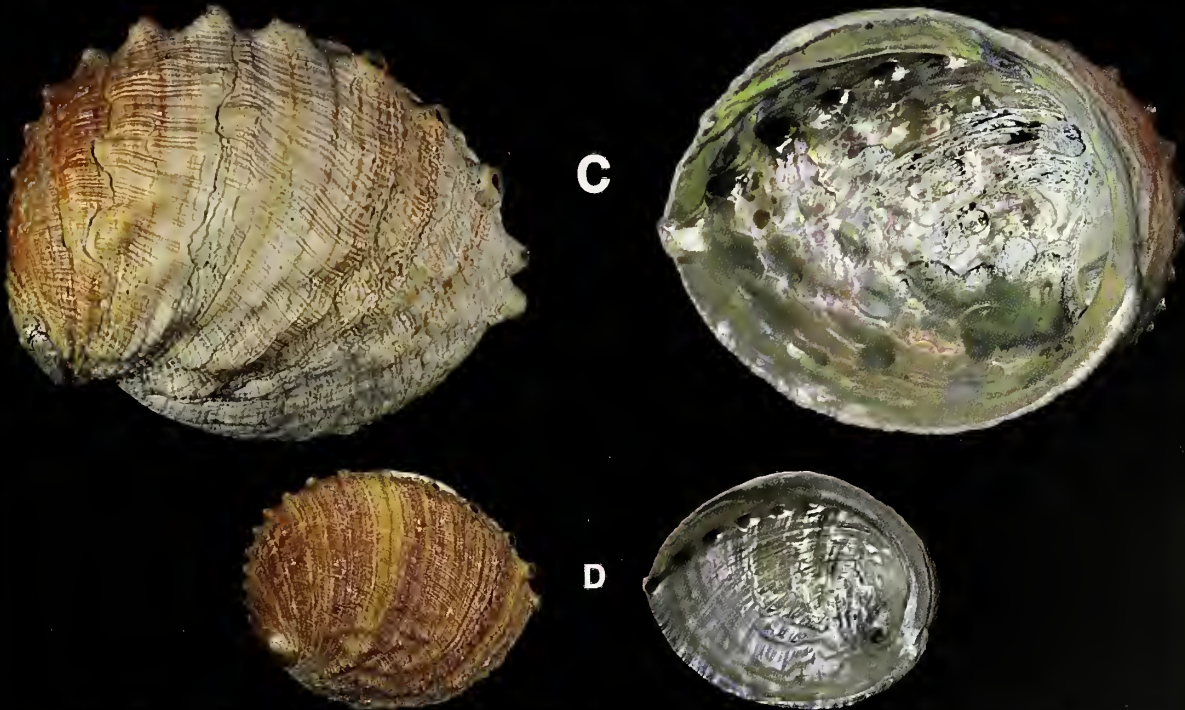
D: *H. walallensis*. Cambria, Calif. 118.1 mm. (Typical specimen to better illustrate species - not to scale with record)

Plate 2

A: *H. c. cracherodii* Leach, 1814. W. Record: 216.5 mm (8 1/2"). Pete McLaughlin. Pacifica, Calif. 1990.
C: *H. walallensis* Stearns, 1899. W. Record: 179 mm (7 1/32"). Dwayne Dinucci. N. California. 2004.



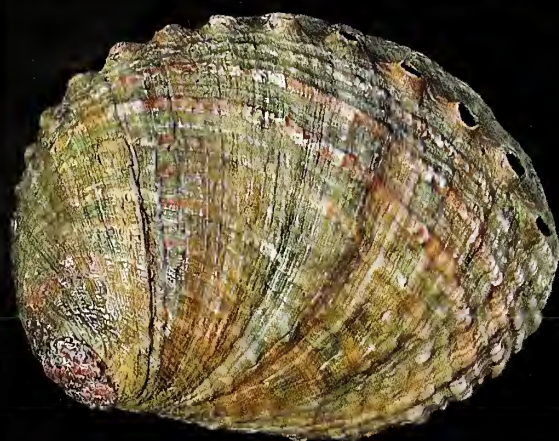
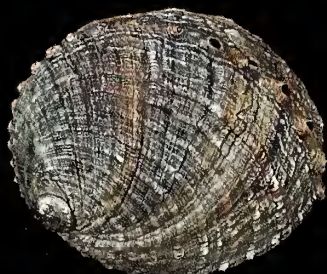
B: *H. c. corrugata*. B. C., Mexico. 153.2 mm. (Typical specimen to better illustrate species - not to scale with record)



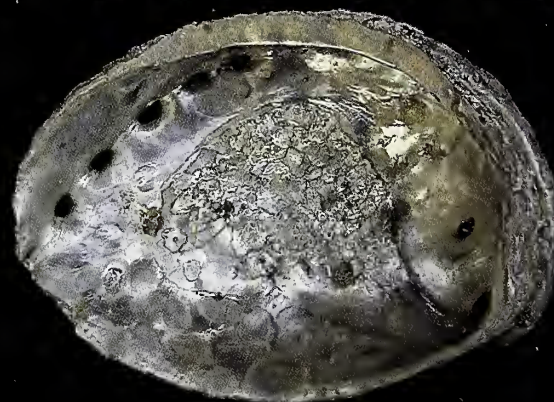
D: *H. sorenseni*. Anacapa Is., Calif. 174.5 mm. (Typical specimen to better illustrate species - not to scale with record)

Plate 3

A: *H. c. corrugata* Wood, 1828. W. Record: 245.6 mm (9 21/32"). Calif. F&G. Palos Verdes, Calif. 1954.
 C: *H. sorenseni* Bartsch, 1940. W. Record (?): 226.1 mm (8 29/32"). Bob McMillen. S. California. 1974.

**A****B**

B: *H. k. assimilis*. Point Loma, Calif. 126.4 mm. (Typical specimen to better illustrate species - not to scale with record)

**C****D**

D: *H. k. kamtschatkana*. Sitka, Alaska. 110.3 mm. (Typical specimen to better illustrate species - not to scale with record)

Plate 4

A: *H. k. kamtschatkana assimilis* Dall, 1878. W. Record: 187.2 mm (7 3/8"). Buzz Owen. Pt. Conception. 1959.
C: *H. k. kamtschatkana* Jonas, 1845. W. Record: 162.2 mm (6 3/8"). Bob Spinale. Canada. 2000.

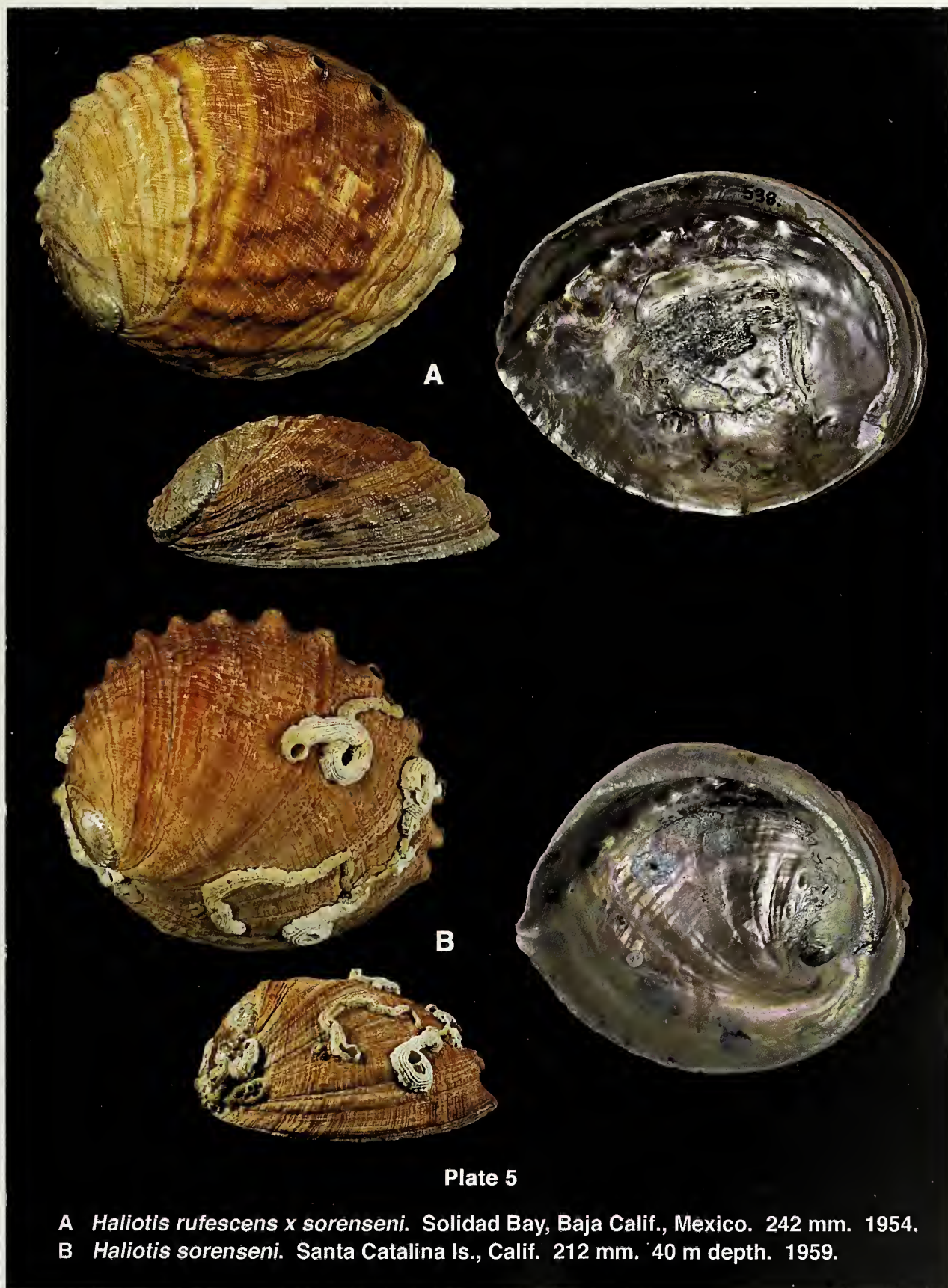


Plate 5

A *Haliotis rufescens x sorenseni*. Solidad Bay, Baja Calif., Mexico. 242 mm. 1954.
B *Haliotis sorenseni*. Santa Catalina Is., Calif. 212 mm. 40 m depth. 1959.

